

REMARKS

Claims 1 to 5, 7 to 21, and 24 to 29 are in the case. Claims 1, 19, 26, and 27 have been amended, claim 6 has been cancelled, and new claims 28 and 29 have been added. Support for the amendment to claim 1 can be found, for example, in previous claim 26 and at page 7, lines 26 to 27, and Example 8. The amendment to claim 1 necessitated amending claim 19. Claim 19 has been amended by incorporating therein subject matter from claim 1. Support for the amendment to claim 26 can be found throughout the application. Claim 27 has been amended by making it depend from claim 1, rather than claim 26. Support for new claims 28 and 29 can be found in the specification at, for example, page 7, lines 21 to 22, and Example 2.

Applicants have previously paid for a total of 25 claims, including three independent claims. By the instant amendment there are 26 claims, including 2 independent claims. Accordingly, payment for one additional dependent claim is included on the attached Fee Transmittal.

Applicants thank the Examiner for indicating the allowability of claims 17, 20 and 21.

Claim Rejections Under 35 U.S.C. § 102

The Examiner rejected claims 1 to 6, 18, and 19 under 35 U.S.C. § 102(b) as being anticipated by Spencer (US Patent No. 1,677,153). By the instant amendment, claim 6 has been cancelled, and claim 1 has been amended such that it now reads:

1. A method for enhancing plant growth or yield, comprising:
treating soil with H₂ gas:
 - (i) at a concentration at least 50 times greater than the concentration of H₂ in air; and
 - (ii) for a duration sufficient to increase H₂ uptake of the soil; and thereafter growing a plant in the soil;wherein said treating soil with H₂ gas enhances plant growth or yield.

Thus, claim 1 now requires that (1) soil is treated with hydrogen at a concentration at least 50 times greater than the concentration of H₂ in air, (2) the treatment is for a duration

sufficient to increase H₂ uptake of the soil; and (3) a plant is grown in the soil after treatment with hydrogen.

Insofar as the rejection might apply to the claims as amended herein, the rejection is respectfully traversed for the following reasons.

The rejection of claim 1 is substantially the same as in the previous Office Action. The Examiner has further suggested that Spencer teaches use of hydrogen at a concentration greater than the concentration of hydrogen in air, as Spencer uses high pressure air (20 to 80 pounds). These air pressures correspond to hydrogen concentrations of about 2.4 to 6.7 times the concentration of hydrogen in air. Thus, Spencer does not use a hydrogen concentration as high as that currently recited in claim 1.

Further, Spencer teaches only briefly treating soil with air at 20 to 80 pounds. In contrast, claim 1 now requires that hydrogen treatment be carried out for a duration long enough to cause an increase in the soil's ability to uptake hydrogen. As taught in the instant application, soil must be treated for at least one week, at the concentrations also taught, before the soil's ability to uptake hydrogen is increased (see, for example, Example 8). Therefore, the treatment of Spencer is of insufficient duration to have such an effect on soil. Moreover, Spencer does not teach or suggest treating soil with air to obtain such an effect.

Applicants note the Examiner's comment on page 7 of the Office Action: "The plain language of Applicant's claims does not specifically claim a beneficial effect to the plant by hydrogen.". In response, Applicants have amended claim 1 to relate enhanced plant growth to hydrogen treatment of soil, by adding the clause "wherein said treating soil with H₂ gas enhances plant growth or yield". It is submitted that claim 1 now claims a beneficial effect to the plant by hydrogen.

It is submitted that claim 1 as amended herein is not anticipated by Spencer. As to the rejections of claims 2 to 6 and 18, it is submitted that in view of claim 1 as currently amended, cancellation of claim 6, and the above arguments, these rejections are overcome.

As to the rejection of claim 19, the Examiner has suggested that Spencer's soil treatment inherently enhances the ability of soil microorganisms to oxidize hydrogen, thereby potentiating enhanced growth of plants. As amended herein, claim 19 recites the limitations of current claim 1; i.e., (1) soil is treated with hydrogen at a concentration at least 50 times greater than the concentration of H₂ in air, (2) the treatment is for a duration sufficient to increase H₂ uptake of the soil; and (3) a plant is grown in the soil after treatment with hydrogen. In contrast, as explained above, Spencer's treatment is too brief, and uses too little hydrogen, to enhance

the ability of soil microorganisms to oxidize hydrogen, as currently claimed. Hence Spencer does not anticipate current claim 19.

In view of the foregoing, withdrawal of the rejection of claims 1 to 5, 18, and 19 and reconsideration are respectfully requested.

Claims 1, 9 to 12, 16, 24, and 25 were rejected under 35 U.S.C. § 102(b) as being anticipated by Nelson (*Applied and Environmental Microbiology* 45:856-861, 1983). Insofar as the rejection might apply to the claims as amended herein, the rejection is respectfully traversed for the following reasons.

Nelson reports on a study to determine the effect of different bacterial isolates on the growth of pea plants. In the study, Hup- and Hup+ isolates were applied to pea plants, and the plants grown at different levels of irradiance. Key to this study is that plants already growing were inoculated with the isolates. Thus, any hydrogen evolved from the microorganisms, or from plants with the microorganisms, was available for use by plants already growing.

In contrast, claim 1 as amended herein requires that the plant is grown in soil after the soil has been treated with hydrogen. Nelson does not teach or suggest growing a plant in soil that has previously been treated with hydrogen, wherein the hydrogen was produced by microorganisms, or by microorganisms or legumes selected for their ability to produce hydrogen. Therefore, Nelson does not anticipate claim 1.

In view of the foregoing, it is submitted that the rejections of claims 1, 9 to 12, 16, 24, and 25 are overcome. Withdrawal of the rejections and reconsideration are respectfully requested.

Claims 1 to 3 and 5 to 8 were rejected under 35 U.S.C. § 102(b) as being anticipated by Yoshida (US Patent No. 4,758,318). Insofar as the rejection might apply to the claims as amended herein, the rejection is respectfully traversed for the following reasons.

Yoshida relates to a method of killing mold in soil that causes diseases in plants. The method involves subjecting soil to a pulsed electrical current, by placing electrodes in the soil, so as to kill the mold. Yoshida teaches that the duration of the electrical current is brief (column

3, lines 1 to 2), and that continuous current does not produce the desired effect (column 3, lines 19 to 25). In Example 1, Yoshida teaches that pulsed electrical current was supplied to a medium containing mold in four 15 minute intervals.

The Examiner suggested that Yoshida anticipates the claims because Yoshida's treatment would produce hydrogen gas. Applicants submit that the brief treatment with electrical current employed by Yoshida would not produce hydrogen for a duration sufficient to increase H₂ uptake of the soil, as required by claim 1 as currently amended.

Applicants submit that Yoshida does not anticipate claims 2, 3, 5, 7, and 8. Accordingly, withdrawal of the rejection and reconsideration are respectfully requested.

Claim Rejections Under 35 U.S.C. § 103

Claims 26 and 27 were rejected under 35 U.S.C. § 103(a) as unpatentable over Spencer. The Examiner suggested that it would have been obvious to modify the method of Spencer by increasing the air pressure to enhance soil characteristics.

As a result of the instant amendment, claim 1 requires that soil is treated with hydrogen gas at a concentration of at least 50 times greater than the concentration of hydrogen in air. However, as noted above, Spencer teaches using air at up to 80 pounds pressure, which corresponds to a hydrogen concentration of only about 6.7 times the hydrogen concentration in air. To attain a hydrogen concentration at least 50 times that of air, as currently claimed, would require extremely high air pressure (at least about 720 pounds), and would not be practical.

Moreover, claim 1 as amended now requires treating the soil for a duration sufficient to increase H₂ uptake of the soil. As previously noted, Spencer does not teach or even suggest such prolonged treatment of soil. Thus, neither of current claims 1, 26, or 27 can be considered obvious in view of Spencer. Withdrawal of the rejection and reconsideration are respectfully requested.

The Examiner stated that claims 13 to 15 were rejected under 35 U.S.C. § 103(a) as unpatentable over Spencer. However, from a reading of the rejection it appears that the Examiner intended to state that the rejection was in view of Nelson.

The Examiner suggested that it would have been obvious to modify the method of Nelson by having the legume with inefficient nitrogen-fixing bacteria (claim 13), distributed nodulation (claim 14), or enhanced number of nodules (claim 15) "depending upon the exact combination of variety of crop/strain of bacteria which would depend upon the goal desired".

Applicants have amended claim 1, from which claims 13 to 15 ultimately depend, to recite that the soil is treated prior to growing a plant in the soil. Nelson discusses the effect of nitrogen-fixing bacteria and legumes on the simultaneous growth of the plants inoculated with the bacteria. Nelson does not teach or suggest that any of the bacteria/legume combinations used may provide a growth-enhancing effect to a subsequently planted crop. Hence Nelson does not render obvious the subject matter of claims 13 to 15. Withdrawal of the rejection and reconsideration are respectfully requested.

Applicants submit that claims 1 to 5, 7 to 21, and 24 to 29 are in condition for allowance and look forward to receiving a Notice of Allowability in the near future. Should the Examiner wish to discuss this application, he is requested to call the undersigned agent at (613) 533-2342.

Please deduct any fee(s) which may be required from our deposit account No. 17-0110.

Respectfully submitted,



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